
Research Article**Protection of *Rafflesia* through the Appreciation of the Dusun's Indigenous Knowledge; A Preliminary Case Study at Poring-Sabah**

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Abstract

Rafflesia is a rare parasitic plant species that is becoming vulnerable to extinction due to the loss of its habitat. To protect this plant from extinction, stakeholders need to coordinate their efforts in maintaining its habitat. Indigenous people are a stakeholder and appreciating their indigenous knowledge about plant and habitat management could help protect the plant. To investigate the potential effects of appreciating indigenous knowledge about *Rafflesia*, a case study was carried out. The investigation was carried out at Poring-Sabah with 59 Dusun residents and tourists interviewed using questionnaires. A content analysis was carried out on the questionnaires. The investigation uncovered the existence of indigenous names and uses for *Rafflesia*. Apart from the plant being used as a tourist attraction, the analysis showed that there are some traditional health uses for the *Rafflesia* plant. The investigation also noted a higher awareness about the protection of the *Rafflesia* plant among the Dusun community compared to the tourists. A description about the protection of the *Rafflesia* plant through the integration of the Dusuns' indigenous knowledge with current knowledge and management systems is provided.

Keywords: Conservation, Kokuanga, Poring Hot Springs, Poring Village, tourists**Introduction**

Conservation Biology is a discipline derived from a biological crisis that emerged in the mid-eighties as a result of biologists noticing dramatic ecological changes in certain regions and society being alarmed by the drastic reduction of biological diversity in those regions (Soule, 1985; Buchholz, 2007). Its two main goals are to examine human impacts on biodiversity and to develop a mixture of practical scientific and humanity approaches to prevent the extinction of species (Soule, 1985). In fact, its success is based on its ability to reconnect people with nature (Balmford & Cowling, 2006). One such

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approach is the development of "The *Rafflesia* Conservation Incentive Scheme" (RCIS) by Sabah Parks as a step in protecting habitats of the *Rafflesia* plant which is a rare plant (Nais, 2001).

The step to protect the habitat of *Rafflesia* has its challenges, and the most immediate challenge is to empower indigenous people i.e. the Dusun ethnic group with conservation-related knowledge (Nais, 2001). This challenge emerged because empowered indigenous people tend to "stereotype" their respective sites that might result in low site diversity when they apply tourism as a tool for conservation as for tourism purposes (Peters, 2008). Central to the said challenge is stakeholders' misunderstanding of the "the underlying assumptions that may constrain the use of theory in practice" (With, 1997; Hayles, 1995); conservation biologists did not take advantage of the Dusun ethnic group's indigenous knowledge when strategising the conservation of *Rafflesia*.

Research was carried to identify perceptions of selected stakeholders about the *Rafflesia* plant and to determine certain terminological aspects of the Dusun language that could support the conservation of *Rafflesia*. This research is aimed at documenting the opportunity of integrating scientific-based information and humanities-based information about *Rafflesia* to help diversify its conservation approaches.

Conservation status of *Rafflesia* in Sabah

Rafflesia is a parasitic genus with only its flower visible and one that grows in limited localities around the tropical rainforest of Southeast Asia. It is a holoparasitic plant that lacks vegetative parts and grows on a specialised host grape-like vine plant from the genus *Tetrastigma* for water and nutrients (Kamarudin, 1991; Nais, 2001). This parasitic plant has no seasonal bloom period. While this parasitic plant habitat is associated to the habitat of its host, scientists generally regard it as a rare plant with specific ecological needs (Nais, 2001). Thus, *Rafflesia* is perceived as a rare plant.

In general, between 50 % and 70 % of the literature on conservation deals with biodiversity threats, species ecology, and species status (With, 1997); decision-making, recovery planning, public perception, attitudes, history and legal aspects are least understood subjects (With, 1997). In this context, although the plant had been known to western sciences for some two centuries now (Kamarudin, 1991; Nais, 2001), studies about it are largely taxonomical and ecological related. Two publications provide a rich source of information about

the morphology, taxonomy and ecology of *Rafflesia*. These publications are *Rafflesia: Magnificent Flower of Sabah* that was authored by Kamarudin Mat Salleh in 1991, and *Rafflesia of The World* that was authored by Jamili Nais in 2001. As a result, the subject of risk assessment and policy for the conservation of *Rafflesia* presents an academic opportunity.

In Sabah, the public's *Rafflesia* conservation effort is in the form of the establishment of a *Rafflesia* reserve, information centre and conservation incentive scheme. The two former efforts have given the public better understanding about the current status of the plant's population as well as the opportunity for environmental education and tourism (Sabah Parks, 2011). Information on the plant in bloom is provided via social media e.g. Facebook. Meanwhile, the *Rafflesia* Conservation Incentive Scheme (RCIS) was the government's initiative to increase indigenous peoples' participation in the conservation of *Rafflesia*. This scheme, aimed at increasing participation among indigenous people in the conservation of *Rafflesia* was largely established based on the understanding that most blooms are found in lands of local communities. Through RCIS, many *Rafflesia* sites were successfully protected from shifting cultivation and conserved through tourism by the Dusun people (Nais & Wilcock, 1998). However, more could be done.

Unaccounted understanding about the *Rafflesia* plant

Historically, although it was first discovered almost 20 years before by the French (Nais, 2001), the *Rafflesia* plant became known through an English publication that dates back to 1818 (Kamarudin, 1991; Nais, 2001). The source of this discovery was a lesser known fact of the *Rafflesia* plant being used by indigenous people for medicinal purposes e.g. a post-natal tonic for women and as an aphrodisiac for men (Kamarudin, 1991; Nais, 2001). Only now is this medicinal potential being looked at; and in a recent phytochemistry study, tannin which has anti-cancer, anti-oxidant and anti-microbial properties was discovered in the *Rafflesia* flower (Tancharoen et al., 2013). This new branch of exploration enriches current understanding about the *Rafflesia* plant other than it being an attractive plant.

In general, the backbone to the conservation of *Rafflesia* is ecology and tourism. Ethno-botanical aspects of the plant were not reasons for society to see this plant as being crucial for conservation. Since other sources of information are lacking, the conservation of *Rafflesia* is limited to its current form. More could be accomplished if certain understandings could be drawn from phytochemistry studies and indigenous knowledge. Hence,

conservationists are challenged to integrate scientific western knowledge with indigenous knowledge.

Merging scientific knowledge and indigenous knowledge

Different people have different views and opinions about knowledge, and this difference could affect the notion of valid knowledge. This is particularly evident when comparing the understanding of scientific knowledge and indigenous knowledge systems. Both knowledge systems have different forms and can perform independently and the distinction between indigenous knowledge and scientific knowledge are based on three aspects which are the substantive differences, epistemological differences as well as contextual differences (Agrawal, 1995). Scientific knowledge is regarded as being open, quantitative, objective and dependent on being a detached centre of rationality and intelligence; while indigenous knowledge is regarded as being closed, subjective, qualitative and emotional yet with a holistic approach (Agrawal, 1995; Mazzocchi, 2006). Indigenous people do not document their knowledge but it is stored in the form of stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs and local language (Halim et al., 2012). As a result, more often indigenous knowledge is hidden and dismissed by the tendency of scientific knowledge to deny the importance of the other (Agrawal, 1995).

The term 'biocultural diversity' was outlined to explore links between the world's biodiversity and linguistics, as well as the causes and consequences of diversity loss at all levels (Maffi, 2002). This connection is significant in itself because it suggests that the diversity of life is made up of diversity in nature, culture and language (UNESCO, 2003) since there is a relationship between languages and biodiversity where there are interrelations between language and the environment, language being a major repository of and transmission vehicle for knowledge (Maffi, 2002).

A barrier to the use of information such as indigenous knowledge and medicinal knowledge to support conservation is the distinction between scientific knowledge and non-scientific knowledge. Scientific knowledge and indigenous knowledge differ in three aspects (Agrawal, 1995): 1) substantive differences 2) methodological and epistemological differences and 3) context differences; indigenous knowledge and scientific knowledge have their own strengths and weaknesses (DeWalt, 1994). To integrate the two different knowledge systems, a complimentary form is needed (DeWalt, 1994).

The use of local language i.e. indigenous language could overcome this limitation where indigenous language carries the information of indigenous knowledge. Hence, biodiversity could be well conserved when local language is applied. The loss of local language means loss of knowledge, beliefs and values of a community.

Methods and Results

This research empirically explored on the appreciation of indigenous language in the conservation of the *Rafflesia* plant. Due to the specification of the subject, Poring-Sabah was selected as the research location. Poring-Sabah, which provides access to one of the Kinabalu World Heritage Site's stations, covers the Poring Hot Springs Substation and the adjacent Poring Village. The chosen research site is illustrated in the following Figure 1.

Data collection for this research was carried out using two social sciences methods i.e. the interview method and the textual frequency method. A total of 59 responses were obtained from nine members of the Dusun ethnic group residing in the village of Poring and who were involved in *Rafflesia*-related activities; and 50 tourists who visited the Poring Hot Springs Substation. Research was done using an open-ended questionnaire to explore the extent of their knowledge about the *Rafflesia* plant, while the documentation of ecological and medicinal information about the *Rafflesia* plant became central to the frequency method.

Data analysis was carried out using descriptive statistic and content analysis approaches; and the analysis was of the interviewees' responses and the groups of information contexts. For analysis, the content of the interviews were summarised and coded (Neuendorf, 2002; Patton, 2002), and coding was carried out in accordance with four themes that carry the local name of the *Rafflesia* plant, the uses of the plant, its characteristics and its conservation. The coded data was statistically described into charts, and compared to determine differences between tourism players.

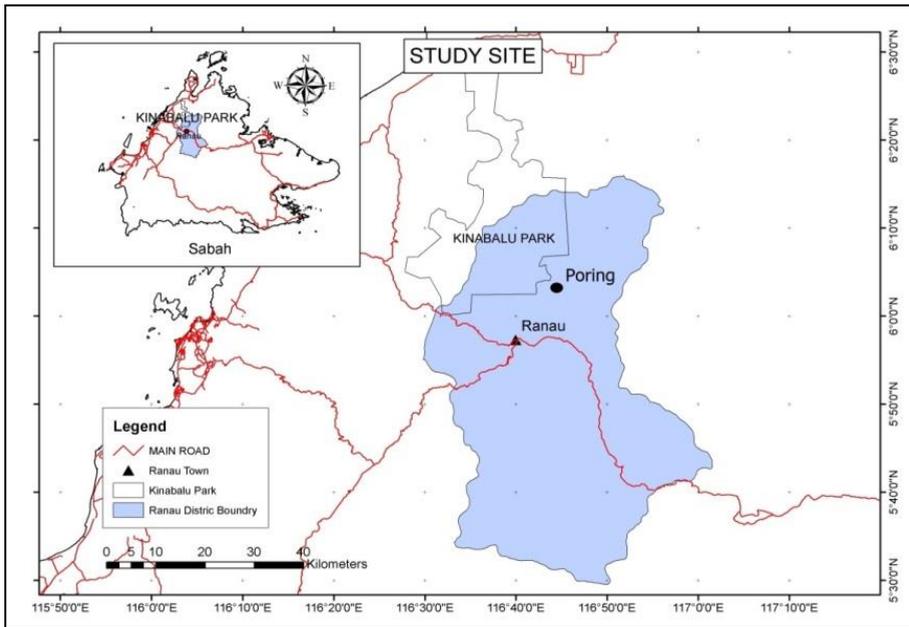


Figure 1. Poring-Sabah as the research site in reference to the research location

***Rafflesia* of Poring-Sabah**

Endemic to the island of Borneo, *Rafflesia keithii* is the largest among the three species of *Rafflesia* found in Sabah. It populates the research location. In general, *Rafflesia keithii* produces the largest flower of all *Rafflesia* found in Sabah. The flower size is between 60 cm to 80 cm. Due to its size, the flower is generally found on the forest floor. Figure 2 shows a flower at the research location.



Figure 2. *Rafflesia* bloom during the period of survey

With exception to the *Rafflesia* within Sabah Parks' Poring Rafflesia Research Centre i.e. Poring Hot Springs, the entire plant specimen in Poring-Sabah is located on lands privately owned by the Dusuns of Poring Village. The distribution of these specimens is shown in Figure 3.

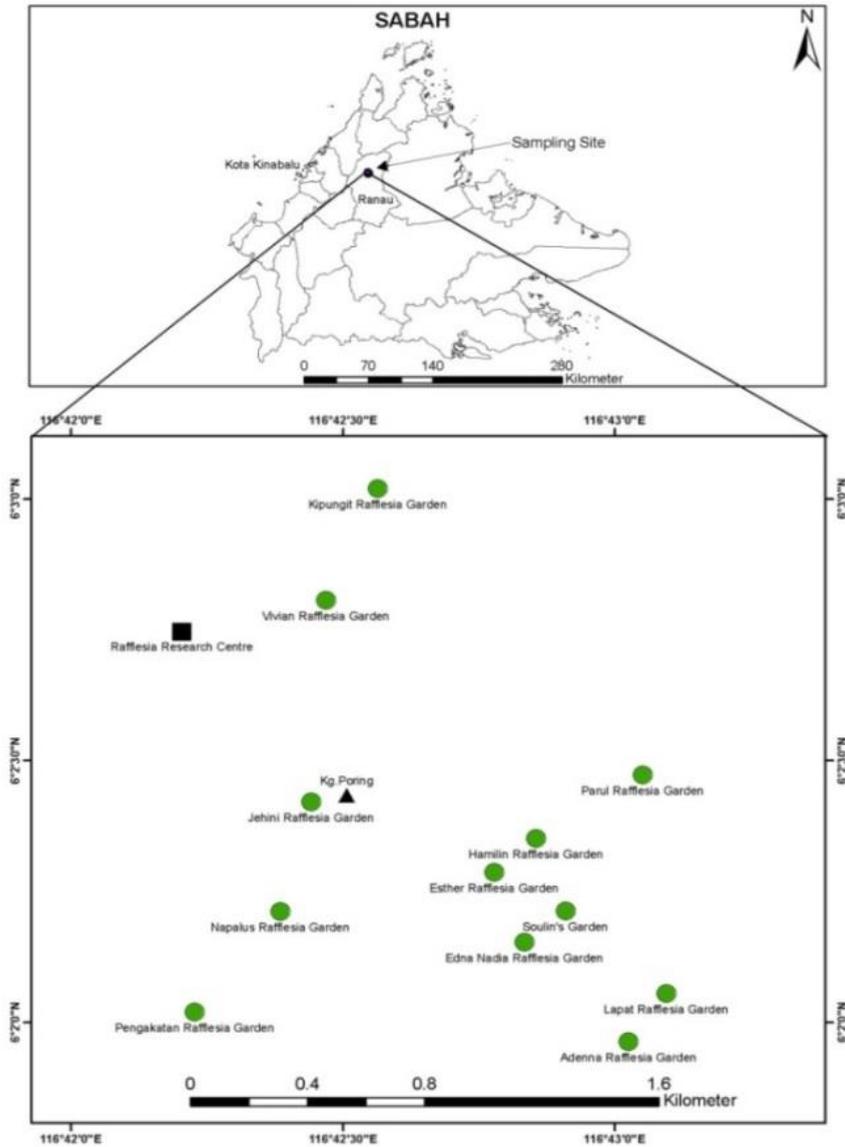


Figure 3. Distribution of *Rafflesia* sites in the research location

In Figure 3, the green dots show the location and ownership of the property where the specimens are found. About 60 % of the families have its own *Rafflesia* garden, which is largely for tourism purposes. Because of this, the local community upkeep the host and parasite.

To manage a *Rafflesia* garden, the site is fenced to avoid human and animal disturbance. In addition, the site is covered to prevent direct penetration of sunlight to the flower which will cause death of the flower and buds. Some land owners even built boardwalks to prevent tourists from disturbing *Rafflesia* flowers and buds. At the time of the field survey, there were thirteen *Rafflesia* sites in Poring. On days when there is a bloom, a signage about the bloom is placed at the road side to attract tourists. A reasonable entrance fee is collected from every visitor based on the discretion of land owners. In areas where the *Rafflesia* is outside of state protection, local communities have devised their own protection approaches.

Respondents' Background

The village of Poring and the Poring Hot Springs were two sites where responses of residents and visitors were obtained. The village in the research location consists of 60 houses and is occupied by the Dusun ethnic group estimated at 650 people. In this study, 78 % of the Dusun respondents come from the 26 to 45 years age group. Some are farmers, while others are involved in the civil service as employees of Sabah Parks. A small number of residents in Poring have taken up tourism as a job by working as porters, guides, handicraft makers, and souvenir sellers and site attraction managers. Some 78 % of the local respondents have secondary level education. As for the tourists, 82 % of them are from a younger group i.e. the 18 to 35 years old age group. Some 80 % of the interviewed tourists possess tertiary education. The age difference and academic difference between host respondents and the visiting respondents suggest that the Dusun people draw their understanding about *Rafflesia* practically, while tourists depend their understanding about the plant academically. A total of 30 % of the interviewed visiting respondents had just seen the *Rafflesia* flower for the first time.

The perception of local contribution in the conservation of *Rafflesia* among Poring's residents and visitors

Among the local community of Poring-Sabah, the *Rafflesia* plant is largely used as a tourism attraction. Similarly, tourists also see *Rafflesia* as a tourism attraction. The following figure shows the perception about the conservation of *Rafflesia* through tourism. Based on the general conservation narrative

about *Rafflesia*, local people support the notion that *Rafflesia* could be conserved through tourism; and this was confirmed by all of the interviewed Dusuns as noted in Figure 4. However, not all tourists support this notion. Sixteen percent of the interviewed tourists disagree that tourism helps in conservation of *Rafflesia*, while 84 % of the interviewed tourists either agree or strongly agree tourism can help conserve *Rafflesia*. A reason for tourists' disagreement about the prospect of *Rafflesia* conservation through tourism is because some tourists do not believe local people would participate

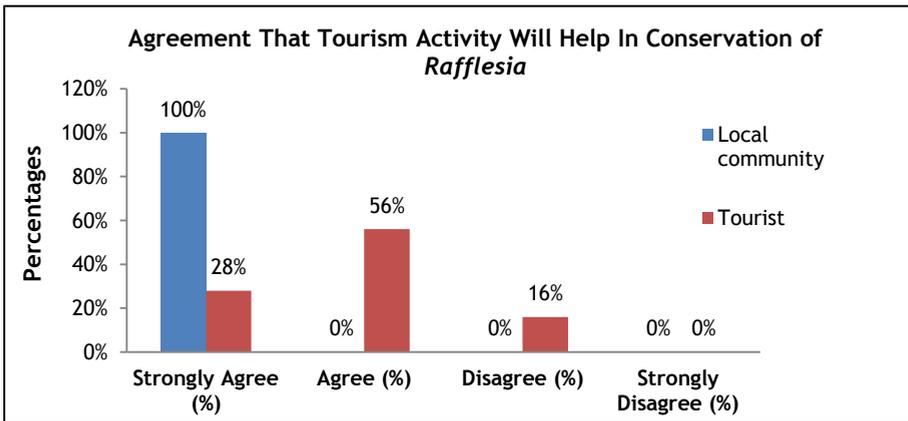


Figure 4. The agreement that tourism activity will help in conservation of *Rafflesia* by the tourists and the local community.

significantly in conservation work; these tourists see conservation work as something more than just the act of land allocation for a particular living organism. Such understanding would certainly influence the perception about local communities' involvement in conservation. The following figure shows the perception of local contribution in *Rafflesia*'s conservation.

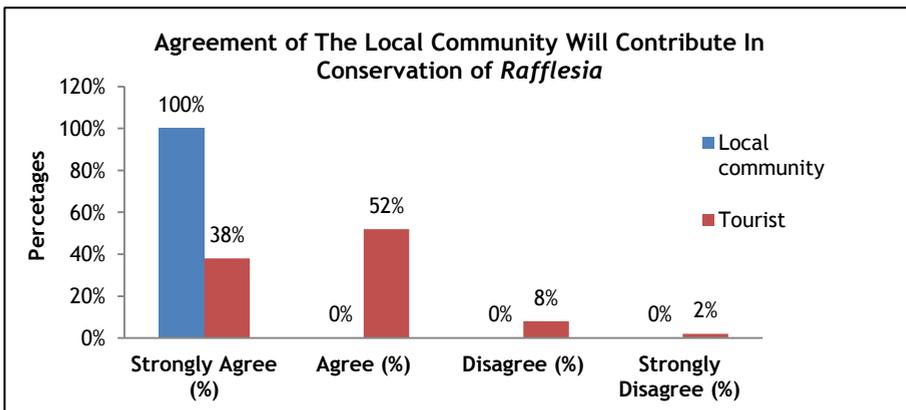


Figure 5. The agreement of the local community will contribute in conservation of *Rafflesia* by tourists and local community

As shown in Figure 5, all interviewees from the local Dusun community in Poring-Sabah strongly agreed that indigenous people do contribute in the conservation of *Rafflesia* since local people did establish *Rafflesia* gardens on their land, thus sacrificing other possible land use. On the other hand, Figure 5 showed that tourists have a different opinion about local contribution in conservation. With certain tourists having some understanding about the need for local participation in conservation, 90 % of tourists agree or strong agree that locals can and do contribute to the conservation of *Rafflesia*. Nevertheless, a significant 10 % of tourists disagree that local people could ever contribute significantly to the conservation of the plant. Taking consideration that some tourists do not believe tourism is sufficient in the conservation of the *Rafflesia* plant; this 10 % of tourists who disagree about local communities' contribution are those who perceive local peoples' involvement in *Rafflesia*-related tourism activities as not related to the act conservation.

The understanding of *Rafflesia* among Poring's residents and visitors

In context of the conservation of *Rafflesia*, this research showed significant difference in perceptions between residents and visitors. Further investigation into the respondents' knowledge reveals factors for the difference in perceptions. In relation to knowledge about the use of *Rafflesia* in medical treatment, tourism and research; there are differences in understanding among Poring's residents and visitors. The following table tabulates these understandings.

Table 1. Respondents understanding about the various application of *Rafflesia*.

Interviewees	Understanding about <i>Rafflesia</i> value		
	Tourism	Education	Medicine
Dusun Residents at the Poring Village	40 %	10 %	50 %
Visitors i.e. Tourists	66 %	26 %	2 %

Table 1 shows the percentage of respondents who have an understanding about the various importance of *Rafflesia*. From the table above, all members of Poring's local community see *Rafflesia* as a valuable plant either in tourism, education or medicine; while among tourists, many knows its tourism value. Six per cent of the tourists interviewed do not know how *Rafflesia* could be useful to society.

Medicinal use of *Rafflesia* shows knowledge difference of Poring's residents and visitors. The interviewed Dusuns of Poring believe that the *Rafflesia* has medicinal properties as opposed to the interviewed tourists. From the interviews, Dusuns claim *Rafflesia* buds could cure high blood pressure and gastric. Besides this, extracts of *Rafflesia* buds could be used as a post-natal tonic to revitalise mothers who had recently delivered.

The Dusun interviewees knew more about *Rafflesia* than tourists for many reasons. Apart from the obvious i.e. the plant is found within the vicinity of the Dusun people's residency, the interviewees know more about *Rafflesia* because they could draw on their indigenous knowledge about the plant. According to a Dusun interviewee, Dusun people do not use the word *Rafflesia* to signify the plant. Instead they named the plant according to the situation in which the plant is spotted in. Accordingly, it was named 'Kokuanga' because it was always seen in a state of full bloom (Abidin, pers. comm.). Apart from naming the flower by its condition, some local names were derived from stories. 'Bunga Rogon' was said to have derived from a hunter's ill encounter with *Rafflesia*. Accordingly, a 'spirit' or locally referred as 'penunggu' seem to possess the flower (Norbert, pers. comm.). From knowledge of the Dusun interviewees, *Rafflesia* has five different local names, largely obtained from ancestors. The flower is also referred among the interviewees as 'Bunga Patma' which they obtained from a Malay term that appeared in the *Rafflesia of The World* publication. The following table contains a list of the indigenous based information.

Table 2. Summary of the local name, its language and its meaning

Local name of <i>Rafflesia</i>	Meaning
Kokuanga	The full blooming of the flower. General name of a flower.
Romoh Runtuk	Dangling. The shoot of the host plant is growing upwards and the flower is growing down on the ground.
Romus	The local community who gave this local name do not know its meaning.
Tembuakar	Refers to the host plant of the <i>Rafflesia</i> . It also comes from the Dusun language. The local community did not know the exact meaning of this word. It might refer to the host plant of the <i>Rafflesia</i> flower.
Bunga Rogon	'Rogon' means ghost.

The most widely used local name is 'Kokuanga'; it dominates 34 % of the Dusuns' knowledge. It also happens to be the general name for most flowers. Among tourists, 76 % did not know *Rafflesia* had a local name, while the rest of the Dusun respondents had heard of its Malay name before i.e Bunga Patma. As a result of the Dusun interviewees drawing on their indigenous knowledge, awareness of *Rafflesia* conservation is extrapolated to be higher among the local community as compared to tourists; tourists see the flower and understand it merely based on its characteristics and ecology.

Discussion and Conclusion

Culture which is dependent on a set of basic assumptions and values, orientations to life, beliefs, policies, procedures and behavioural conventions that are shared by a group of people (Spencer-Oatey, 2008), is the basis for differences that exist between different groups of people. This difference has resulted in one object having a number of names in different languages (Cooper, 2007), and the parasitic plant *Rafflesia* provides an example. Through this research it was discovered that residents of Poring-Sabah recognise *Rafflesia* as 'Kokuanga', 'Romoh Runtuk', 'Romus', 'Tembuakar', 'Bunga Patma' and 'Bunga Rogon', as well as *Rafflesia*. On the other hand, visitors of Poring-Sabah are only familiar with the term *Rafflesia*.

The existence of vernacular names does more than just show cultural differences. It suggests local communities possessing *a priori* knowledge that could be useful in contemporary conservation exercises. In the context of this study, the only parasitic plant that lives off the *Tetrastigma* vine in Poring-Sabah i.e. *Rafflesia keithii* is scientifically unique and rare. However, its current conservation value and status is closely associated as a tourism attraction and in relation to biodiversity. Cultural related characteristics of *Rafflesia* could influence the plant's conservation value and status.

The conservation value and status of an organism has many aspects. One aspect relates to the level of education that a person. Under contemporary science, higher education level people tend to have a greater level of conservation awareness. This means that a person's attitude and perception can have an impact on the management of a natural resource (Shibia, 2010). In this study, most of Poring-Sabah's local residents who were interviewed only had secondary level education as opposed to visitors of Poring-Sabah who generally has tertiary education. However, locals have a higher level of conservation awareness as opposed to tourists. This finding is in contrast to

Mohamed Shibia's research, and the reason is Poring-Sabah's local community constantly engages with conservation-related activities through their own *Rafflesia* gardens, Rafflesia Conservation Incentive Scheme, or through other Dusuns who work at the adjacent public conservation agency i.e. Sabah Parks. Along with the Dusuns' cultural understanding about *Rafflesia*, higher level of education does not guarantee greater level of conservation awareness. Hence, cultural and traditional practices could affect the conservation value and status of an organism.

Culture and traditional practices affect the conservation value and status of an organism. To maintain this value and status, the management of the organism needs to incorporate cultural aspects. Currently, *Rafflesia* is a tourism attraction that is heavily promoted by local tourism agencies. Successful destinations that have capitalised on *Rafflesia* include Kokob village in Ranau and Poring-Sabah (Nais & Wilcock, 1998). While *Rafflesia* might have medicinal properties due to the existence of tannin and phenols, its use for that purposed is still localised (Nais, 2001). Given that the medicinal properties of *Rafflesia* are still localised and not incorporated into the larger body of knowledge about *Rafflesia*, its conservation is also rather limited.

Indigenous peoples have developed their own indigenous systems that have safeguarded their communities, a sustainable lifestyle and use of resources within their surroundings (Halim et al., 2012). This system is incorporated into their language. Since, a local language is an important tool for the transmission of indigenous knowledge, languages associated with the indigenous knowledge could bring to the sustainable management of resources and conservation of biodiversity (Unasho, 2013). This is because language and indigenous knowledge cannot be seen in isolation and should be conserved simultaneously in order to guarantee sustainable management of biodiversity conservation (Unasho, 2013).

Besides being part of one's identity (Melissa & Chen, 2010), language is a major repository of and a transmission vehicle for knowledge (Maffi, 2002). The need to pay tribute to indigenous languages could go beyond this and include indigenous people partaking in conservation activities. When the local language is stressed on, local people may be willing to put more effort in conservation. Loss of vocabulary as social genes of culture and some words becoming obsolete have not only negative impacts on the proficiency and communicative functions of the language, but also on biodiversity conservation because life in a particular human environment is dependent on

people's ability to express the environment using words (cultural genes) of the language. Like knowledge, language is capable of dying when "rather than *Rafflesia* being transformed through use and intergenerational transmission, a given language becomes increasingly restricted in use, and ultimately ceases to be passed on from one generation to the next" (Maffi, 2002). Therefore, language has a direct positive effect on biodiversity conservation (Unasho, 2013).

The understanding of *Rafflesia* and conservation differs between indigenous people and non-indigenous people. Indigenous people possess more knowledge about the *Rafflesia* and have high conservation awareness compared to the non-indigenous people. The understanding of *Rafflesia* differs in the aspects of the usage of *Rafflesia*, local names and characteristics to distinguish the flower. Indigenous people may possess useful knowledge that could complement western sciences in conserving the plant and its habitat, but the conservation of *Rafflesia* has yet to make use of people' knowledge, and benefit from it.

This study focuses on the potential of local language, in this case, the Dusun language, in the conservation of *Rafflesia*. The Dusun language is a tool to transmit indigenous knowledge of the local people. To use this language, the Dusuns need to be involved in conservation activities. *A priori* knowledge can be integrated into the conservation of the species. In this case, appreciation of the local name could be used in conservation of the *Rafflesia* flower. Scientists need to understand the local language so that they can work together effectively because appreciation means an expression of gratitude towards local names; or to increase the value of local names among the public since the appreciation of local names could have a positive effect in the conservation of *Rafflesia*. More research on the use of local languages in conservation of biodiversity is needed.

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